Supramolecular Nanochemistry and Advanced NMR

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The research activity of the group is focused on the development of self-organized nanosystems for molecular recognition and innovative NMR methods for their structural investigation. Monolayer-protected gold, silica and polylipoic nanoparticles are the key scaffolds of our systems. We demonstrated how self-organization of these nanoparticles can be exploited for cooperative catalysis, sensing and drug delivery. The most relevant application is the NMR detection of analytes: using tailor-made receptor nanoparticles and custom NMR sequences we demonstrated the possibility to extract the ^{1}H spectrum of the target molecules from that of the whole mixture even at micromolar concentrations. Other fields explored include pH_2 hyperpolarization, food analysis, the study of nano-bio interactions, photonic nanohybrids. The group is supported by EU (MSCA-ITN), CARIPARO, AIRC.

1. "On the Metal-Aided Catalytic Mechanism for Phosphodiester Bond Cleavage Performed by Nanozymes" *ACS Catalysis*, **2021**, 11, 8736-8748.
2. "Hybrid nanoreceptors for high sensitivity detection of small molecules by NMR chemosensing" *Chem. Commun.* **2021**, 57, 3002-3005.
3. "Host-Guest Allosteric Control of an Artificial Phosphatase" *J. Am. Chem. Soc.*, **2020**, 142, 6837-6841.
4. "Nanoparticle-assisted NMR spectroscopy: Enhanced detection of analytes by water mediated saturation transfer" *J. Am. Chem. Soc.,* **2019**, *141*, 4870–4877.
5. "Molecular-Dynamics-Simulation-Directed Rational Design of Nanoreceptors with Targeted Affinity" *Angew. Chem.-Int. Edit.*, **2019**, *58*, 7702-7707.